

Claims

1. Amplifier apparatus comprising a power amplifier (4) having an operating frequency in the radio frequency ('RF') or microwave or higher ranges and a pre-distorter (2), the characteristics of said power amplifier (4) comprising a distortion from a linear transfer function, said pre-distorter (2) comprising a non-linear path (7), a linear path (8), input means (6) responsive to an amplifier input signal for applying respective pre-distorter input signals to said paths (7, 8) and combining means (13) for combining a linear signal from said linear path (8) with a non-linear signal from said non-linear path (7) to produce a pre-distorted signal, the characteristics of said pre-distorter (2) comprising a distortion relative to a linear transfer function such as to tend to compensate for the distortion of the transfer function of said power amplifier,
characterised in that said input means (6) is arranged to apply said pre-distorter input signals to said paths (7, 8) substantially in relative phase opposition and said combining means (13) is arranged to combine said signals from said paths (7, 8) without introducing any significant relative phase difference.
2. Amplifier apparatus as claimed in claim 1, wherein said input means (6) comprises reactive components (16 to 21) introducing opposite phase differences of substantially $\pm 90^\circ$ respectively relative to said amplifier input signal.
3. Amplifier apparatus as claimed in claim 1 or 2, wherein said input means (6) and said combining means (13) consist substantially of passive components (16 to 21, 30 to 36).
4. Amplifier apparatus as claimed in claim 3, wherein said combining means (13) comprises reactive components (30 to 35), together with a resistive component (36) decoupling said paths (7, 8).
5. Amplifier apparatus as claimed in any preceding claim, wherein said non-linear path (7) comprises a non-linear path amplifier (9), and a non-linear path

attenuator (10) for receiving a signal from said non-linear path amplifier (9), and said linear path (8) comprises a linear path attenuator (11), and a linear path amplifier (12) for receiving a signal from said linear path attenuator (11).

6. Amplifier apparatus as claimed in claim 5, wherein said non-linear path amplifier (9) is arranged to operate at conditions of bias voltage and signal amplitude substantially equal to those of at least a final stage (15) of said power amplifier (4) and said linear path amplifier (12) is arranged to operate at smaller signal amplitude but at similar conditions of bias voltage.
7. Amplifier apparatus as claimed in any preceding claim, wherein substantially all the components of said pre-distorter (2) are formed in a common semiconductor substrate.
8. Amplifier apparatus as claimed in claim 7, wherein components of said power amplifier (4) are formed in said common semiconductor substrate.
9. Amplifier apparatus as claimed in claim 8, wherein substantially all the components of at least a first stage (14) of said power amplifier (4) are formed in said common semiconductor substrate.
10. Amplifier apparatus as claimed in any preceding claim, wherein the outputs of said input means (6) and the inputs of said combining means (13) each present an impedance substantially matched to 100 Ohms, and the input of said input means (6) and the output of said combining means (13) each present an impedance substantially matched to 50 Ohms.
11. Amplifier apparatus as claimed in any preceding claim, and comprising a variable attenuator (3) interposed between said power amplifier (4) and said pre-distorter (2).